MERITOR WABCO

Maintenance Manual MM-1291

OnLane™ Lane Departure Warning (LDW) System

Revised 05-14

About This Manual

This manual provides installation procedures as well as the diagnostic procedures required to troubleshoot the OnLane™ lane departure warning (LDW) system installed in a vehicle.

Before You Begin

1. Read and understand all instructions and procedures before you begin to service components.
2. Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.
3. Follow your company's maintenance and service, installation, and diagnostics guidelines.
4. Use special tools when required to help avoid serious personal injury and damage to components.

Hazard Alert Messages and Torque Symbols

⚠ WARNING

A Warning alerts you to an instruction or procedure that you must follow exactly to avoid serious personal injury and damage to components.

⚠ CAUTION

A Caution alerts you to an instruction or procedure that you must follow exactly to avoid damage to components.

This symbol alerts you to tighten fasteners to a specified torque value.

How to Obtain Additional Maintenance, Service and Product Information

Visit Literature on Demand at meritor.com to access and order additional information.

Contact the Meritor OnTrac™ Customer Call Center at 866-668-7221 (United States and Canada); 001-800-889-1834 (Mexico); or email OnTrac@meritor.com.

How to Obtain Replacement Components

To order replacement components for the OnLane™ LDW System, call Meritor's Commercial Vehicle Aftermarket at 888-725-9355.

Please have the following information available:

- Truck make
- Truck model
- Truck model year
- LDW part number and serial number from the flag label located on the LDW wiring pigtail
- Number of LDW system speakers

If Tools and Supplies are Specified in This Manual

Contact Meritor's Commercial Vehicle Aftermarket at 888-725-9355.

Information contained in this publication was in effect at the time the publication was approved for printing and is subject to change without notice or liability. Meritor WABCO reserves the right to revise the information presented or to discontinue the production of parts described at any time.

Contents

pg. **1** **Section 1: Introduction**
Description
System Components
LDW Camera Module with Mounting Screws
2 LDW Windshield Mounting Bracket
LDW Mounting Bracket

3 **Section 2: Diagnostics, Troubleshooting and Testing**
Inspection and Tests
Visual Inspection
Power On Self Test
Functional Check
LDW System Test
4 TOOLBOX™ 11.1 Software
5 OnLane™ LDW Diagnostic Trouble Code Table
7 Retrieving Video Capture Files
9 Circuit Descriptions and Diagnostics
Green LDW Enabled Indicator
Amber LDW Not Available Indicator
10 LDW Switch Input
11 Left Turn Signal Input
12 Right Turn Signal Input
Left Audio Warning Output
14 Right Audio Warning Output
15 Brake Switch Input

16 **Section 3: Component Replacement**
Procedures
New Installation of the LDW System
17 Replacing a New LDW Module on an Existing Bracket
18 Replacing a Complete LDW Module and Bracket
20 Wiring Harness Installation OnLane™
22 Connecting Wiring Harness to Vehicle Wiring
Verifying Correct System Operation
23 OnLane™ Circuit Mode Test
OnLane™ Test Mode Faults

Description

The OnLane™ Lane Departure Warning (LDW) System employs a camera mounted near the upper center of the windshield that observes the vehicle's position in its lane. In the event of a unintentional lane change, the system alerts the operator of the possible unintended event by sounding audible warnings through a set of speakers. Figure 1.1.

4010095a

Figure 1.1

The system operates automatically when the vehicle is moving on a roadway with painted lane markings. It identifies intentional lane changes by monitoring the turn signals, brake switch and vehicle speed. The optional alertness and warning feature also assists the operator by providing an audible warning when a predetermined amount of lane drift or speed fluctuation has been exceeded.

System performance may be degraded or completely disabled under these conditions.

- Dirty or damaged windshield
- Poor lighting conditions caused by inoperable headlamp(s) or severe road glare
- Poor weather conditions such as snow, ice, heavy fog or heavy rain
- Poor pavement conditions such as broken road surface, ice, snow, sand, dirt or gravel covering the road surface
- Missing, worn, faded, damaged or covered lane markers

When the system cannot provide assistance, the vehicle's amber LDW Not Available indicator is turned ON. Resolution of these factors should enable the system to automatically return to normal operation, as indicated by the amber LDW Not Available indicator being turned OFF.

⚠ WARNING

The OnLane™ system was designed, manufactured and installed as an operator assistant. This system is not intended to replace good attentive driving behaviors and practices which may change based upon traffic and road conditions.

Please refer to the OnLane™ Lane Departure Warning (LDW) Drivers Guide for information on the correct operation and understanding of the situations in which the system may not provide assistance.

System Components

LDW Camera Module with Mounting Screws

This component has the following features. Figure 1.2.

- Dimensions (not including bracket) 5.39 x 2.2 x 1.39" (136 x 56 x 34 mm) (W x H x D)
- Weight: 0.86 lb (390 g) (including wiring pigtail)
- Cast aluminum with matte black finish
- Light shield feature protects lens, reduces reflections and prevents tampering
- Attaches to bracket using two T-15 torx head screws.

4010097a

Figure 1.2

LDW Windshield Mounting Bracket

This component has the following features. Figure 1.3.

- Dimensions: 3.15 x 1.69 x 0.28” (80 x 43 x 7 mm) (W x H x D)
- Weight: 0.66 lb (30 g)
- Cast aluminum with matte black finish
- Attaches to windshield using pressure-sensitive adhesive
- Optional low-profile bracket design allows application of bracket at windshield supplier.

Figure 1.3

LDW Mounting Bracket

A copy of the OnLane™ LDW Driver’s Guide can be downloaded at Meritor.com. Figure 1.4.

OnLane™
Lane Departure
Warning System
This Driver Tips Guide applies to trucks and tractors equipped with the OnLane™ Lane Departure Warning System with SafeTrak technology by Takata. OnLane is a Camera-based warning system that observes and calculates the truck’s position within the lane. In the event of an unintentional lane change, the system provides audible warnings to inform the driver of this unintended event, alerting the driver to make appropriate steering adjustments.
The system utilizes a camera mounted near the top center of the vehicle windshield. Vehicle speakers provide audible warnings. Included with the system is the DAW (Driver Alertness Warning). This system assists the driver by providing an audible warning when the calculated alertness, based on the vehicle’s stability within the lane, falls below an alertness threshold.
Warning: The OnLane system was designed, manufactured and installed as a driver assistant. This system is not intended to replace good attentive driving behaviors, which may change based on traffic and road conditions. Please read the following information to properly operate the system and understand the situations in which this system may not provide assistance.
MERITOR WABCO
Safety Driving. Efficiency Smart.
4010792a

Figure 1.4

Inspection and Tests

Visual Inspection

Perform a visual inspection of the LDW system before proceeding with any diagnosis.

- Ensure that the area of the windshield in front of the LDW is clean and there is nothing obstructing the camera lens. Figure 2.1.

Figure 2.1

- Ensure that the mounting bracket is firmly attached to the windshield and that the LDW unit is firmly attached to the mounting bracket by carefully trying to wiggle the LDW unit by hand.
- Inspect for any visual damage to the mounting bracket of the LDW unit.
- Ensure that there are no loose or corroded connections, particularly where the LDW wiring may have been spliced into the vehicle harness.
- Inspect the wiring for cut or frayed areas that could cause an open circuit or a short to the vehicle body, which results in a short-to-ground condition.

Power On Self Test

The system performs a series of self tests on startup during which the vehicle indicators and system speakers operate for approximately one second. After successful completion of the self-test, the vehicle's green System Enabled indicator is ON, indicating that the system is ready for use. If the Power ON Self Tests do not complete successfully, the vehicle's green System Enabled indicator begins flashing to indicate which fault codes are present. Refer to the fault code chart for further description of the flash fault codes.

Functional Check

If the Power On Self tests are not successful, the vehicle's green System Enabled indicator begins to flash indicating the identified fault(s).

The fault code is read by counting the series of green System Enabled indicator flashes. For example, if a code 2, 3 is present, the indicator will flash ON two times and then pause for 3 seconds and flash ON 3 more times.

When the system has completed flashing out a fault code, it will turn off the green System Enabled indicator for 6 seconds. If more than one fault code is present, the system will flash out a new fault code after the 6 second indicator off period. The system continues to flash out new codes after each 6 second indicator off period is completed until all codes have been flashed out.

To repeat the fault code flash sequence, push and release the LDW Enable Switch.

LDW System Test

The LDW System test is intended to be used after the system is installed in a vehicle to help verify the system is wired properly. It is recommended that this procedure be performed whenever the system has been newly installed in a vehicle or when repairs have been made to the system wiring.

To enter the System test.

1. Turn ignition key to power up cab. During start up, the green and yellow indicators in the OnLane™ rocker switch are turned on.
2. Wait for the audible start-up tones to complete. If the indicators do not light or there are no start-up tones, check the OnLane™ power and ground connections, the switch connections and the speaker connections.

3. Enter test mode by depressing the OnLane™ rocker switch at least seven times within ten seconds after the audible start-up tones are complete. The system indicates that it is in test mode by giving a short tone through the left speaker followed by one through the right speaker. In a single speaker system, both tones will come through that speaker. While in test mode, the green LDW Enabled indicator is turned off and the amber LDW Not Available indicator flashes.

   This test mode times out in 10 minutes. Turning off the vehicle also causes the test mode to close.

   If the amber LDW Not Available indicator is ON and green LDW Enabled indicator is OFF, a system fault is present. The system identifies the fault by flashing the green LDW Enabled indicator.

   If the left turn signal is activated while in test mode, the system gives an audible tone through the left speaker.

   If the right turn signal is activated while in test mode, systems equipped with two speakers give an audible tone through the right speaker.

   Systems equipped with a single speaker give an audible tone through the single speaker for both left and right turn signal activation.

   If the brake pedal is pressed, the system will activate the green LDW Enabled indicator.

   If the green LDW Enabled indicator flashes, the system is identifying a fault listed in Table A.

TOOLBOX™ 11.1 Software

NOTE: You must use TOOLBOX™ 11.1 Software or higher. To download TOOLBOX™ 11.1 Software, visit meritorwabco.com.

To access the Meritor WABCO TOOLBOX™ 11.1 Software from the desktop screen, double-click on the Meritor WABCO TOOLBOX™ icon. Figure 2.2.

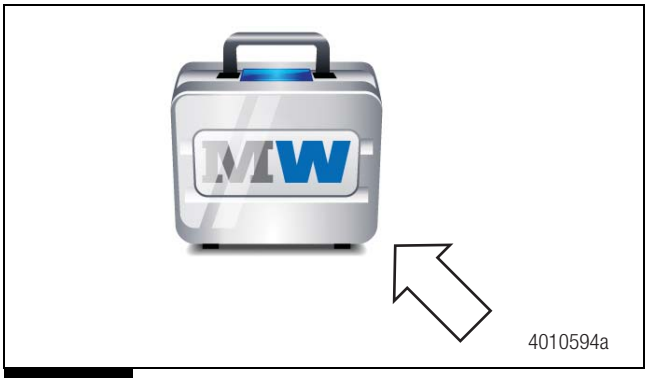

Figure 2.2

From the message box that appears, click on the OnLane™ LDW Diagnostics button. Figure 2.3.

Figure 2.3

Retrieving Diagnostic Trouble Codes

1. Once the OnLane™ Diagnostics button is selected, the active Diagnostic Trouble Codes (DTCs) will be displayed. Figure 2.4.

Figure 2.4

2. A description of the DTC, the number of times the DTC occurred, the suspect parameter number (SPN) and the failure mode identifier (FMI) are all displayed in the Diagnostic Trouble Codes window. After making the necessary repairs, OnLane™ LDW will clear the DTCs.

OnLane™ LDW Diagnostic Trouble Code Table

The following table provides repair instructions and the corresponding Troubleshooting Sections in this manual for SPN/FMI DTCs that are readable using TOOLBOX™ 11.1 Software. If the display shows a code not listed in the table, contact the Meritor OnTrac™ Customer Call Center at 866-OnTrac1 (668-7221) for assistance.

Table A: OnLane™ LDW Diagnostic Trouble Codes

Blink Code	SPN (dec)	FMI (dec)	Description	Detection Method	Action
1	1705	7	Dirty windshield	If the system detects a dirty or blocked window	Clean windshield, remove visual obstructions
2	1705	31	LDW Malfunction	Any non-recoverable, internal LDW failure. This fault can be set by any of the following: - DSP memory access and memory write failures on power up. - Imager communication fault received from the DSP. - Detection of VIOP VBATT voltage < 9 or > 32. - DSP 1.8 voltage supply > 1.91 or < 1.7- DSP 1.2 voltage supply > 1.28 or < 1.12 - VIOP to DSP initialization problems after 10 retries. - Imager over temperature	Call OnTrac™ at 866-668-7221.
3	1705	15	ECU Over Temperature	If temperature at image sensor is > 85°C	Provide cooling to the OnLane™ unit and retest after the unit is cooled to touch.
3, 1	3564	4	LDW Switch input stuck Low	If (LDW Enable/Disable Source = discrete) and (LDW Enable/ Disable Switch Type = momentary) and LDW switch input is stuck low for 1 +/-10% minute	Service LDW switch circuit
3, 2	2368	2	Left turn signal input stuck high	If (Turn Signal Source = J1939) AND the J1939 OEL message indicates left turn signal error or not available, OR if OEL message is not received. If (Turn Signal Source = VP37) AND the VP37 message indicates left turn signal error or not available, OR if VP37 message is not received.	Service Left turn signal circuit
3, 3	2370	2	Right turn signal input stuck high	If (Turn Signal Source = J1939) AND the J1939 OEL message indicates right turn signal error or not available, OR if OEL message is not received. If (Turn Signal Source = VP37) AND the VP37 message indicates right turn signal error or not available, OR if VP37 message is not received.	Service Right turn signal circuit

Blink Code	SPN (dec)	FMI (dec)	Description	Detection Method	Action
3, 4	597	2	Brake input stuck high	If (Brake Source = J1939)AND brake status equals error value as defined in J1939. This is checked whenever the J1939 message is received.	Service Brake input circuit
4, 1	1702	3	Enabled indicator short to battery	Low-side driver chip diagnostics. Tested on power on and when LDW enable indicator transition from off to on.	Service Enabled indicator short to battery
4, 3	1702	5	Enabled indicator output open or short to ground	Low-side driver chip diagnostics. Tested on power on and when LDW enable indicator transition from on to off	Service Enabled indicator circuit open or short to ground
5, 1	1710	3	Not Available indicator output short to battery	Low-side driver chip diagnostics. Tested on power on and when Not Available indicator transition from on to off	Service Not Available indicator circuit short to battery
5, 3	1710	5	Not Available indicator output open or short to ground	Low-side driver chip diagnostics. Tested on power on and when Not Available indicator transition from on to off	Service Not Available indicator circuit open or short to ground
6, 1	1704	31	Left audio warning ouput problem	Any detectable problem with the DAC or audio amplifier. Reported if SPI communications to the DAC fails.	Service left audio speaker and/or circuit
6, 2	1703	31	Right audio warning output problem	Any detectable problem with the DAC or audio amplifier. Reported if SPI communications to the DAC fails.	Service right audio speaker and/or circuit
7, 1	639	31	J1939 network problem	If vehicle speed message is not received	Verify J1939 data is on the vehicle communications bus using the standard vehicle diagnostic tool. If normal vehicle communications exist, service the vehicle wiring to the LDW connector.
8, 1	628	2	OnLane™ ECU internal failure	If memory check fails. EEPROM crc does not match the crc that is stored for the used EEPROM range, set this fault. Tested periodically	Call OnTrac™ at 866-668-7221.
8, 2	630	2	OnLane™ ECU internal failure	If calibration file is missing or corrupt. Reported whenever DSP reports a corruption.	Call OnTrac™ at 866-668-7221.

Retrieving Video Capture Files

1. If the OnLane™ module has video and data capture enabled, the download can be retrieved by clicking on the Video menu. This will open a new window. Figure 2.5.

Figure 2.5

2. From the VDR tab in the new window, select the 'Read VDR Log'. This will load the logs from the module into the file list.
3. Select a file from the file list to download or preview.
4. Clicking the 'View Preview' button will display the image at the moment the event occurred.
5. Clicking the 'Read Selected Clips' button will initiate the video download.

   The video file will be downloaded in .mov file format. The video will show the recording along with the frame numbers. When the frame number turns red, this indicates when the event recording was triggered.
6. Clicking the 'Read Data From Selected' button will initiate the data download. Figure 2.6.

   The data file will be downloaded in a .csv file format. The data will show the reason why the event was recorded along with several other pieces of vehicle data. Refer toTable B and Table C to analyze this data.

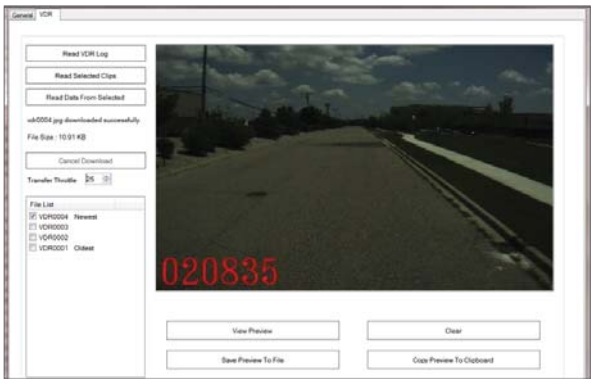

Figure 2.6

Table B: Trigger Definition

Trigger Number	Trigger Mask	Trigger Name	Details
2	0x0004	Hard Brake	Vehicle speed decreases by 7 mph in 1 second
16	0x10000	ABS	If ABS is active (PGN 61441 SPN 563) for 1 second and speed > 20 mph
17	0x20000	ATC	If brake control (SPN 562) active for 1 second or engine control (SPN 561) active for 1 second
18	0x40000	RSC	If speed > 20 mph and [If brake control (SPN 1818) active at all or engine control (SPN1816) active for 1 second]
19	0x80000	ESC	If speed > 20 mph and [If brake control (SPN 1819) active at all or engine control (SPN1817) active for 1 second]
20	0x100000	External FCW Audible	If ACC1 SPN 5022 from src 0x2A and XBR (pgn 1024 SPN 2920) is 0
21	0x200000	External FCW Haptic	If ACC1 SPN 5022 from src 0x2A and XBR (pgn 1024 SPN 2920) is -2.5 m/s^2
22	0x400000	External FCW CMB	If ACC1 SPN 5022 from src 0x2A and XBR (pgn 1024 SPN 2920) is -3.5 m/s^2

Table C: EDR Column Definitions

Column Name	Description
frame_num	Image frame number (Increments 30 times per second). This can be useful for matching EDR data to VDR frames.
odometer (m)	Vehicle odometer
trigger_reason	The reason the VDR/EDR event was recorded.
trigger_mask	Trigger events that occurred during (but not necessarily have caused) the recording.
LDW_mute	0 = LDW system enabled, 1 = LDW system manually disabled by the driver
wipers	0 = wipers off or not connected to OnLane™, 1 = wipers on
left_turn	0 = left turn signal off, 1 = left turn signal on
right_turn	0 = right turn signal off, 1 = right turn signal on
brake	0 = brake off, 1 = brake on
speed (cm/s)	Speed of the OnLane™ equipped vehicle.
yaw_rate (rad/s)	Yaw rate of the OnLane™ equipped vehicle.
yaw_rate_valid	0 = OnLane™ is not receiving a valid yaw rate signal, 1 = yaw rate signal is being received
system_error	0 = no error present, 1 = OnLane™ is in a fault condition
FCW_mute	0 = the vision-based FCW is neither disabled by the driver nor by a radar-based FCW system. 1 = The vision-based FCW is disabled by the driver or by a radar-based FCW system.
silence	0 = No vehicle system has disabled OnLane™, 1 = an external vehicle system is disabling OnLane™
AI_alertness_index	Driver Alertness Index. Range 0-100. Numbers greater than 60 indicate the driver seems to be alert.
LDAT_lateral_offset	Distance between vehicle center and center of the lane in cm (right is positive).
FCW_ttc (ms)	The visually estimated time to collision.
FCW_range (cm)	The visually estimated range to the target.
HWW_headway (ms)	The visually estimated time gap between the OnLane™ equipped vehicle and the lead vehicle.

Circuit Descriptions and Diagnostics

Green LDW Enabled Indicator

Mounting locations for the LDW Enabled indicator vary with vehicle application. Please consult the system user's manual for the location in your vehicle.

The following simplified diagram represents the green LDW indicator circuit. Although they may not be shown here, additional in-line connectors and splices may be present in the circuit depending upon the particular vehicle installation. Figure 2.7.

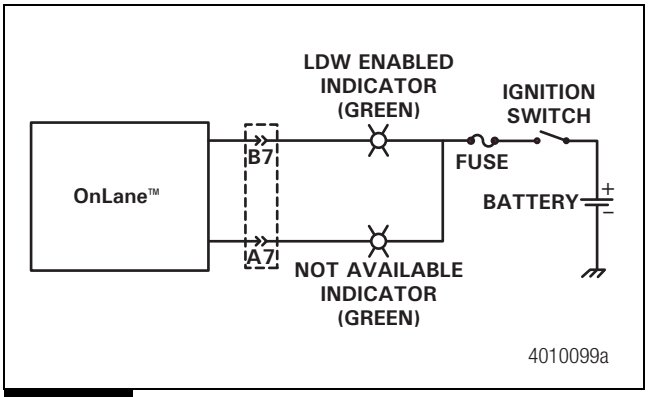

Figure 2.7

Circuit Diagnosis

1. Disconnect the vehicle side of the LDW connector and measure for voltage from B7 to the ground terminal B9. Figure 2.8.

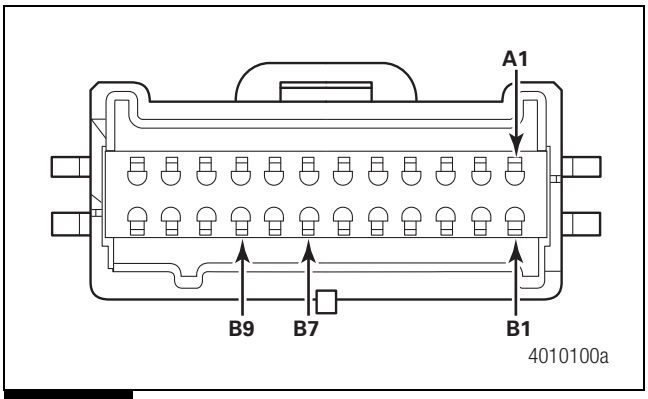

Figure 2.8

- **If 12 +/- 3 volts are present:** Continue to Step 2.
- **If there is no voltage on B7:** Go to Step 3.

2. Remove the fuse powering the LDW Enabled indicator. Measure the voltage between terminal B7 and the ground terminal B9.
   - **If 12 +/- 3 volts are present:** This condition should have set a code 4, 1 during LDW key-on self test. There is a short in the power between the LDW Enabled indicator circuit between the LDW connector and the Enabled connector. Repair this short.
   - **If there is no voltage:** Go to Step 3.
3. Use an ohmmeter to check for continuity between terminal B7 and the ground terminal B9.
   - **If there is continuity:** This condition should have set a code 4, 3 during LDW key-on self test. Service the short to ground in LDW Enabled indicator circuit.
   - **If there is no continuity:** Go to Step 4.
4. **If there is no continuity:** This condition should have set a code 4, 3 during LDW key-on self test. Service open in the LDW Enabled indicator circuit between the LDW connector and the LDW indicator fuse.

   If there is continuity: Service or replace LDW Enabled indicator.

Amber LDW Not Available Indicator

Mounting locations for the LDW Not Available indicator varies with vehicle application. Please consult the system's user manual for the location in your vehicle.

The following simplified diagram represents the amber LDW Not Available indicator circuit. Although they may not be shown here, additional in-line connectors and splices may be present in the circuit, depending upon the particular vehicle installation. Figure 2.9.

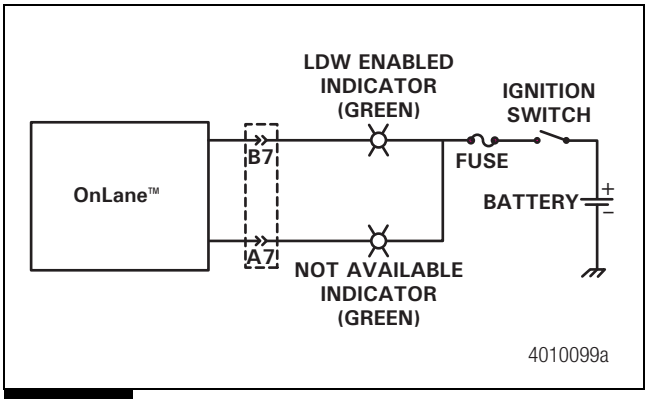

Figure 2.9

Circuit Diagnosis

1. Disconnect the vehicle side of the LDW connector and measure for voltage from terminal A7 to the ground terminal B9. Figure 2.10.

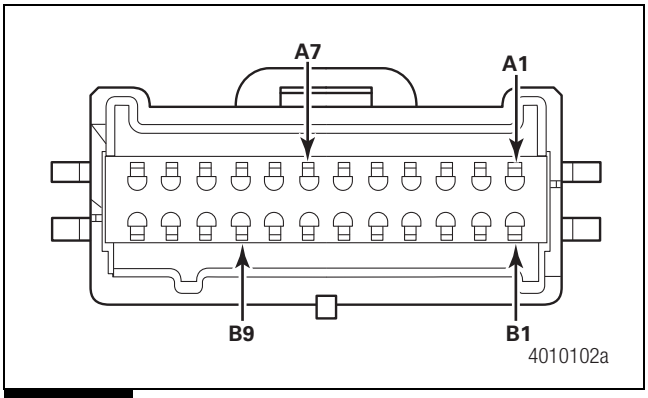

Figure 2.10

   - **If the measured voltage is in the range of 12 +/- 3 volts:** Continue to Step 2.
   - **If there is no voltage on A7:** Go to Step 3.

2. Remove the fuse powering the LDW Not Available indicator. Measure the voltage between terminal A7 and the ground terminal B9.
   - **If the measured voltage is in the range of 12 +/- 3 volts:** This condition should have set a code 5, 1 during LDW key-on self test. There is a short in the power in the LDW Not Available indicator circuit between the LDW Not Available connector and the LDW connector. Repair this short.
   - **If there is no voltage present:** Go to Step 3.

3. Use an ohmmeter to check for continuity between terminal A7 and the ground terminal B9.
   - **If there is continuity:** This condition should have set a code 5, 3 during LDW key-on self test. Service the short to ground in LDW Not Available indicator circuit.
   - **If there is no continuity:** Go to Step 4.

4. Remove the fuse from the output side of the LDW indicator fuse holder. Measure continuity between this fuse holder and terminal A7.
   - **If there is no continuity:** This condition should have set a code 5, 3 during LDW key-on self test. Service open in the LDW Enabled indicator circuit between the LDW connector and the LDW indicator fuse.
   - **If there is continuity:** Service or replace LDW Not Available indicator.

LDW Switch Input

Mounting locations for the LDW switch vary with vehicle application. Please consult the system's user manual for the location in your vehicle.

The following simplified diagram represents the LDW switch indicator circuit. Although they may not be shown here, additional in-line connectors and splices may be present in the circuit, depending upon the particular vehicle installation. Figure 2.11.

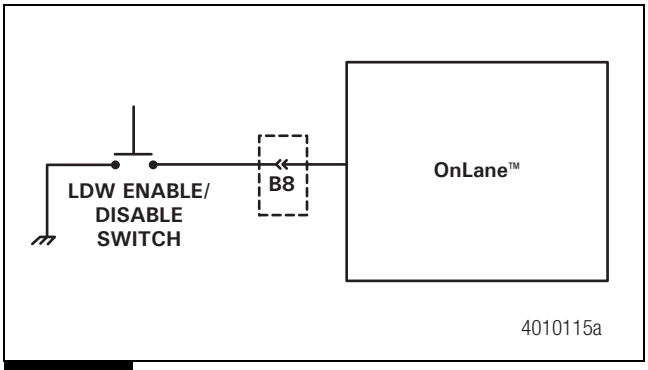

Figure 2.11

Circuit Diagnosis

1. Disconnect the vehicle side of the LDW connector and measure for voltage from terminal B8 to the ground terminal B9. Figure 2.12.

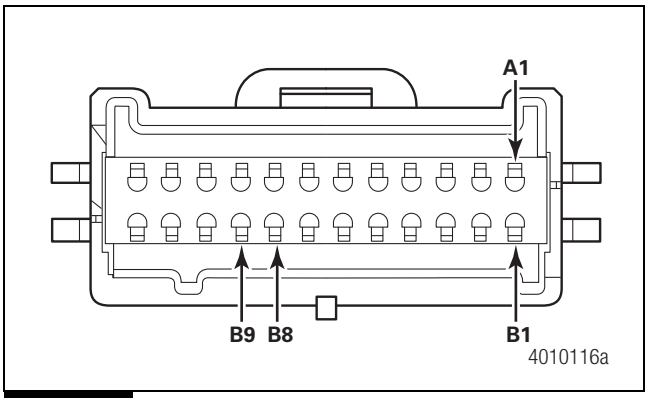

Figure 2.12

- **If there is no voltage on B8:** Continue to Step 2.
- **If voltage is present:** Repair short to power on LDW enable switch circuit.

2. Disconnect the LDW connector and hold the LDW enable/disable switch closed. Measure for continuity between terminal B8 and the ground terminal B9.
   - **If there is continuity:** Continue to Step 3.
   - **If there is no continuity to the ground terminal B9:** Service open in the in switch circuit between LDW connector and switch.
3. While NOT holding the LDW enable/disable switch closed, measure for continuity between terminal B8 and the ground terminal B9.
   - **If there is continuity:** This condition should have set a code 3, 1 during LDW key-on self test. Service the short to ground in LDW switch input circuit.
   - **If there is no continuity between terminal B8 and the ground terminal B9:** Perform LDW System test.

Left Turn Signal Input

The following simplified diagram represents the left turn signal input circuit. The LDW receives left turn signal information directly from the vehicle's turn signal circuit without any relays or additional switches. Verify that the vehicle turn signals are operating properly before beginning any testing of the LDW turn signal inputs.

Although they are not shown here, additional in-line connectors and splices may be present in the circuit, depending upon the particular vehicle installation. Figure 2.13.

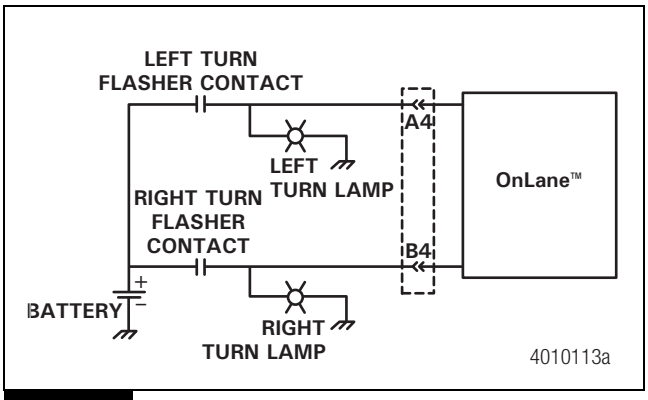

Figure 2.13

Circuit Diagnosis

1. Verify correct vehicle turn signal operation to make sure turn signal switch and relay(s) are functioning properly. Proceed with the following steps only if vehicle turn signals operate properly.

   Turn on the left turn signal and measure the voltage from terminal A4 to the ground terminal B9. Figure 2.14.

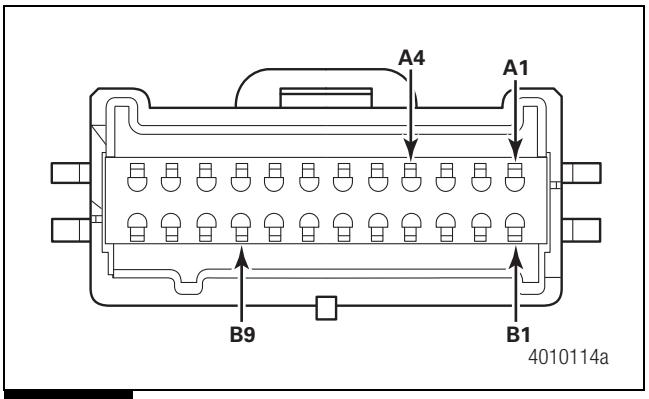

Figure 2.14

   The voltage should be switching between 12 +/-3 and 0 volts.
   - **If there is no voltage on A4:** Continue to Step 2.
   - **If voltage is present, but does not switch:** This condition should have set a code 3, 2 during LDW key-on self test. Service short to power on turn signal circuit.
   - **If voltage switches between 12 +/- 3 and 0 volts and code 3, 2 was set during LDW key-on self test:** Rerun the key-on self test and contact Customer Support if code still occurs.
2. Turn off the turn signal and disconnect the LDW connector. Measure for continuity between terminal A4 and the ground terminal B9.
   - **If there is continuity between terminal A4 and the ground terminal B9:** Service short to the ground terminal B9 in the left turn signal input circuit.
   - **If there is no continuity to ground:** Service open in the left turn signal circuit to LDW.

Right Turn Signal Input

The following simplified diagram represents the right turn signal input circuit. The LDW receives right turn signal information directly from the vehicle's turn signal circuit without any relays or additional switches. Verify that the vehicle turn signals are operating properly before beginning any testing of the LDW turn signal inputs.

Although they are not shown here, additional in-line connectors and splices may be present in the circuit, depending upon the particular vehicle installation. Figure 2.15.

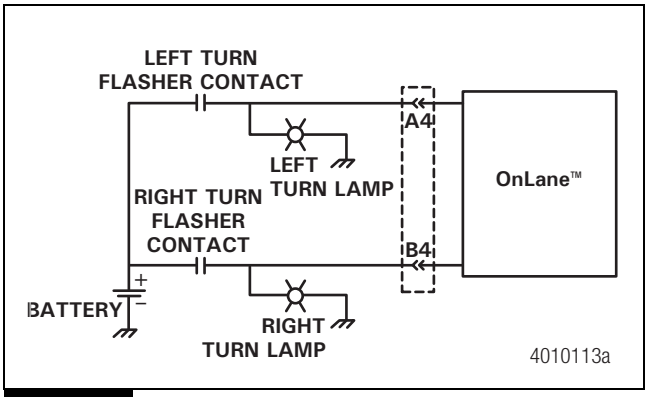

Figure 2.15

Circuit Diagnosis

1. Verify correct vehicle turn signal operation to make sure turn signal switch and relay(s) are functioning properly. Proceed with the following steps only if vehicle turn signals operate correctly.

   Turn on the right turn signal and measure the voltage from terminal B4 to the ground terminal B9. Figure 2.16.

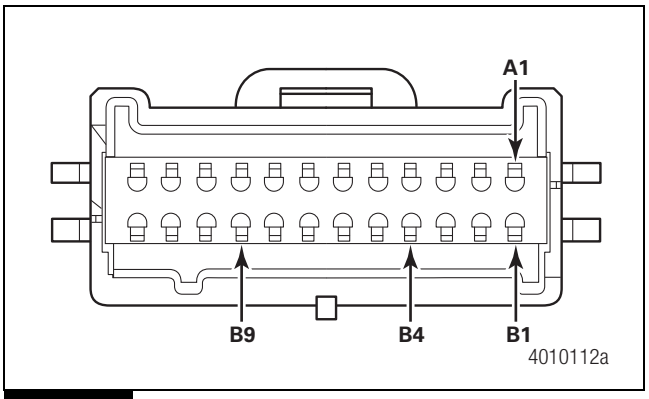

Figure 2.16

   The voltage should be switching between 12 +/-3 and 0 volts.

   - **If there is no voltage on B4:** Continue to Step 2.
   - **If voltage is present, but does not switch:** This condition should have set a code 3, 3 during LDW key-on self test. Service short to power on turn signal circuit.
   - **If voltage switches between 12 +/- 3 and 0 volts and code 3, 3 was set during LDW key-on self test:** Rerun the key-on self test and contact Customer Support if code still occurs.

2. Turn off the turn signal and disconnect the LDW connector. Measure for continuity between terminal B4 and the ground terminal B9.

   - **If there is continuity between terminal B4 and the ground terminal B9:** Service short to the ground terminal B9 in the right turn signal input circuit.
   - **If there is no continuity to ground:** Service open in the right turn signal circuit to LDW.

Left Audio Warning Output

The following simplified diagram represents the left speaker circuit. Although they are not shown here, additional in-line connectors and splices may be present in the circuit, depending upon the particular vehicle installation. The LDW speaker outputs are compatible with both 4 ohm and 8 ohm speakers. Figure 2.17.

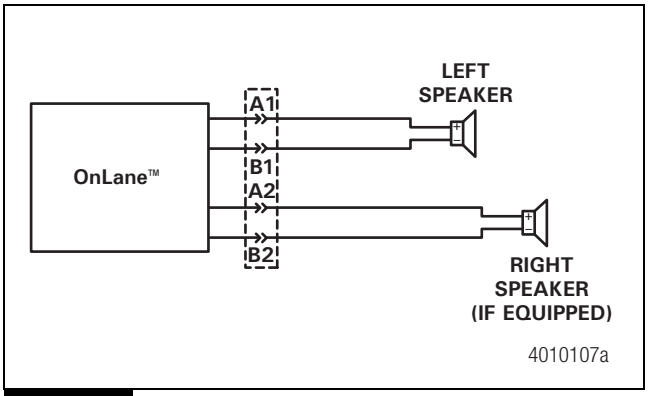

Figure 2.17

Circuit Diagnosis

1. Disconnect the LDW connector and measure from terminal A1 to the ground terminal B9 on the vehicle harness side for short to 12 volts. Figure 2.18.

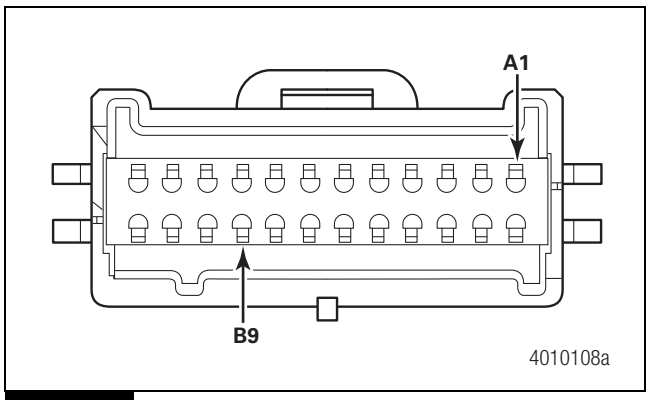

Figure 2.18

   - **If the measured voltage is in the range of 12 +/- 3 volts:** Repair short to battery in left audio warning output.
   - **If there is no voltage:** Continue to Step 2.

2. Measure from terminal B1 to the ground terminal B9 for a short to 12 volts on the vehicle harness side.
   - **If the measured voltage is in the range of 12 +/- 3 volts:** Repair short to battery in left audio warning output.
   - **If there is no voltage:** Continue to Step 3.

3. Measure from terminal A1 to terminal B1 on the vehicle harness side for left speaker resistance.
   - **If resistance is less than 3 ohms:** Service the short between speaker wires.
   - **If resistance is approximately 4 ohms or approximately 8 ohms:** Continue to Step 4.
   - **If resistance is greater than 9 ohms:** Continue to Step 6.

4. Measure the resistance between terminal A1 and ground.
   - **If there is continuity between the A1 terminal and ground:** Service the short to ground in the left speaker out positive circuit.
   - **If there is no continuity to ground:** Continue to Step 5.

5. Measure the resistance between terminal B1 and ground.
   - **If there is continuity between the B1 terminal and ground:** Service the short to ground in the left speaker out negative circuit.
   - **If there is no continuity to ground:** Continue to Step 6.

6. Disconnect the left front speaker and measure resistance between terminal A1 and left speaker positive terminal at the speaker connector.
   - **If resistance is less than one ohm between terminal A1 at the LDW connector and the left speaker positive terminal:** Continue to Step 7.
   - **If resistance is greater than one ohm between terminal A1 at the LDW connector and the left speaker positive terminal:** Service open in left speaker positive wiring.

7. Disconnect the left front speaker and measure resistance between terminal B1 and left speaker negative terminal at the speaker connector.
   - **If resistance is less than one ohm between terminal B1 at the LDW connector and left speaker positive terminal:** Continue to Step 8.
   - **If resistance is greater than 1 ohm:** Service open in left speaker negative wiring.

8. Connect a known good speaker to the left speaker connector and rerun the system diagnostic test.
   - **If the system diagnostic tests pass the left speaker testing:** Replace the original speaker with a new one.

Right Audio Warning Output

The following simplified diagram represents the right speaker circuit. Although they are not shown here, additional in-line connectors and splices may be present in the circuit, depending upon the particular vehicle installation. The LDW speaker outputs are compatible with both 4 ohm and 8 ohm speakers. Figure 2.19.

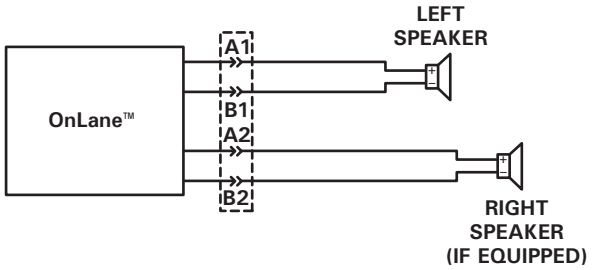

Figure 2.19

Circuit Diagnosis

1. Disconnect the LDW connector and measure from terminal A2 to the ground terminal B9 on the vehicle harness side for short to 12 volts. Figure 2.20.

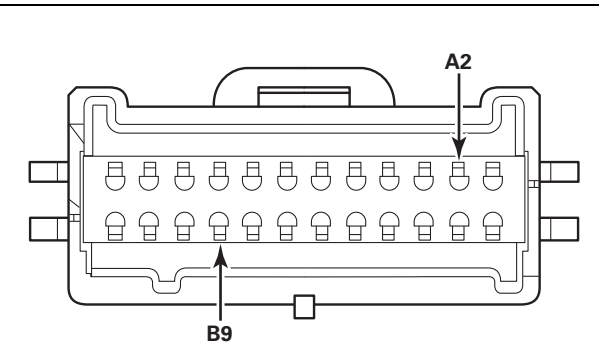

Figure 2.20

- **If the measured voltage is in the range of 12 +/- 3 volts:** Repair short to battery in right audio warning output.
- **If there is no voltage:** Continue to Step 2.

2. Measure from terminal B2 to the ground terminal B9 on the vehicle harness side for short to 12 volts. Figure 2.21.

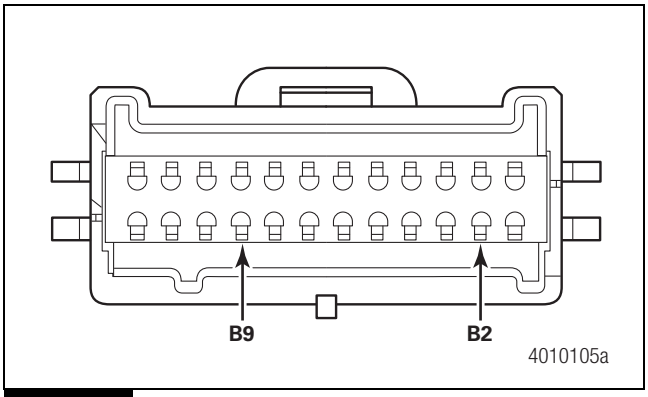

Figure 2.21

- **If the measured voltage is in the range of 12 +/- 3 volts:** Repair short to battery in the right audio warning output.
- **If there is no voltage:** Continue to Step 3.

3. Measure from terminal A2 to terminal B2 on the vehicle harness side for right speaker resistance. Figure 2.22.

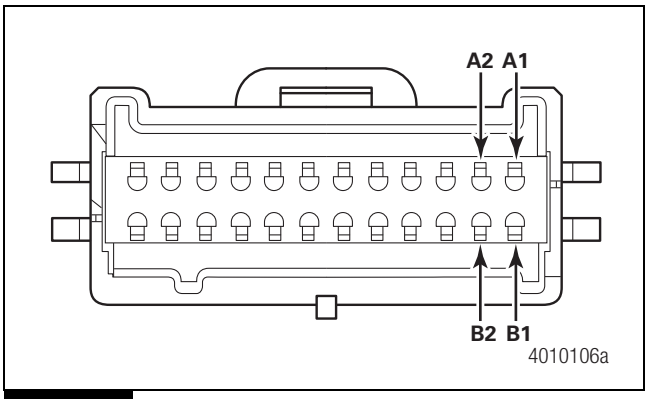

Figure 2.22

- **If resistance is less than 3 ohms:** Service the short between speaker wires.
- **If resistance is approximately 4 ohms or approximately 8 ohms:** Continue to Step 4.
- **If resistance is greater than 9 ohms:** Continue to Step 6.

4. Measure resistance between terminal A2 and ground.

- **If there is continuity between the A2 terminal and ground:** Service the short to ground in the right speaker out positive circuit.
- **If there is no continuity to ground:** Continue to Step 5.

5. Measure resistance between terminal B2 and ground.
   - **If there is continuity between the B2 terminal and ground:** Service the short to ground in the left speaker out negative circuit.
   - **If there is no continuity to ground:** Continue to Step 6.
6. Disconnect the right speaker and measure resistance between terminal A2 and the right speaker positive terminal at the speaker connector.
   - **If resistance is less than one ohm between terminal A2 and the right speaker positive terminal:** Continue to Step 7.
   - **If resistance is greater than one ohm between terminal A2 and the right speaker positive terminal:** Service open in right speaker positive wiring.
7. Disconnect the right front speaker and measure resistance between terminal B2 and the right speaker negative terminal at the speaker connector.
   - **If resistance is less than one ohm between terminal B2 and the right speaker negative terminal:** Continue to Step 8.
   - **If resistance is greater than one ohm between terminal B2 and the right speaker negative terminal:** Service open in right speaker positive wiring.
8. Connect a known good speaker to the right speaker connector and rerun the system diagnostic test.
   - If the system diagnostic tests pass the right speaker testing, replace the original speaker with a new one.

Brake Switch Input

The following simplified diagram represents the brake switch signal input circuit. The LDW receives brake signal information directly from the vehicle's brake light circuit without any additional relays or switches. Verify that the vehicle brake signals are operating correctly before beginning any testing of the LDW brake signal input. Although they may not be shown here, in-line connectors and splices may be present in the circuit depending upon the particular vehicle installation.

In some vehicles, the brake signal is received by the J1939 bus instead of by a discrete input on Terminal A8. Figure 2.23.

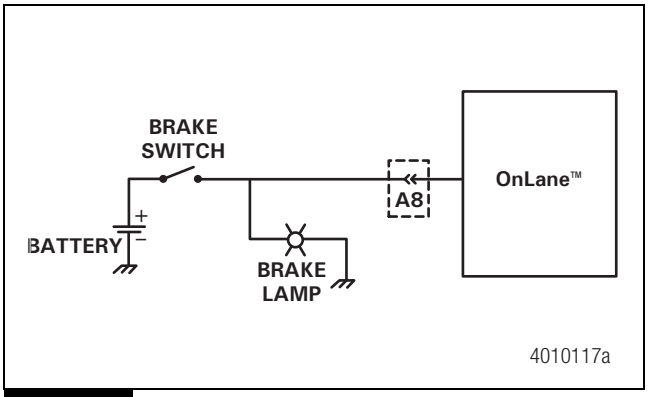

Figure 2.23

Circuit Diagnosis

1. Verify correct vehicle brake light operation to make sure brake switch is not out of adjustment or stuck closed. Proceed with the following steps only if vehicle brake lights operate correctly.

   Disconnect the LDW connector and measure for voltage between terminal A8 and the ground terminal B9 on the vehicle harness side of the connector. Do not press the brake pedal at this time.
   - **If the measured voltage on A8 is in the range of 12 +/- 3 volts:** This condition should set a LDW self test fault code of 3, 4. Service short to power in circuit between LDW connector and vehicle harness.
   - **If there is no voltage:** Continue to Step 2.
2. Press and hold the brake pedal while back probing the LDW connector and measure for voltage between terminal A8 and the ground terminal B9. There should be 12 +/-3 volts on terminal A8 only when the brake switch is held down.
   - **If there is no voltage:** Service open in circuit between LDW connector and brake light switch.
   - **If the voltage is present only when the brake switch is held down and LDW self test code 3, 4 is present:** Replace the LDW unit.

Hazard Alert Messages

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

⚠ WARNING

To prevent serious eye injury, always wear safety eye protection when you perform vehicle maintenance or service.

⚠ WARNING

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

Procedures

New Installation of the LDW System

The procedure for installing a new LDW system will vary depending on the vehicle in which the unit is being installed. Each vehicle may have slightly different routing and wiring requirements.

Before securing the bracket to the windshield, note that the locations of the mounting screws on the bracket are not tapped. We recommend that you install the bracket to the LDW module before installing it in the vehicle. Use the self-tapping mounting screws of the LDW module to start the threads for the mounting screws on the bracket. This action will allow for easier installation of the LDW module to the bracket, once the bracket is installed to the windshield.

The LDW system should only be installed on a windshield when the glass temperature is within the recommended range between 70–100°F (21– 37°C). Do not apply the bracket if the windshield temperature is below 60°F (15°C).

1. Loosen the headliner and A-pillar trim panels as outlined in the vehicle service manual to allow room to route the wiring behind the header panel and down the A-pillar.
2. Clean the windshield mounting surface with IPA wipe (50/50 mix of isopropyl alcohol and water) or equivalent cleaner.
3. Allow the mounting surface to dry completely before proceeding to the next step. The windshield surface must be free of all oil, moisture and dirt for correct mounting bracket adhesion.

   NOTE: To download mounting bracket installation templates, visit the OnLane™ literature web page at meritorwabco.com.

4. Align the template so that the markings on the template are square to the centerline markings and the frit/trim line markings at the top of the windshield. Figure 3.1. The template shown is an example only.

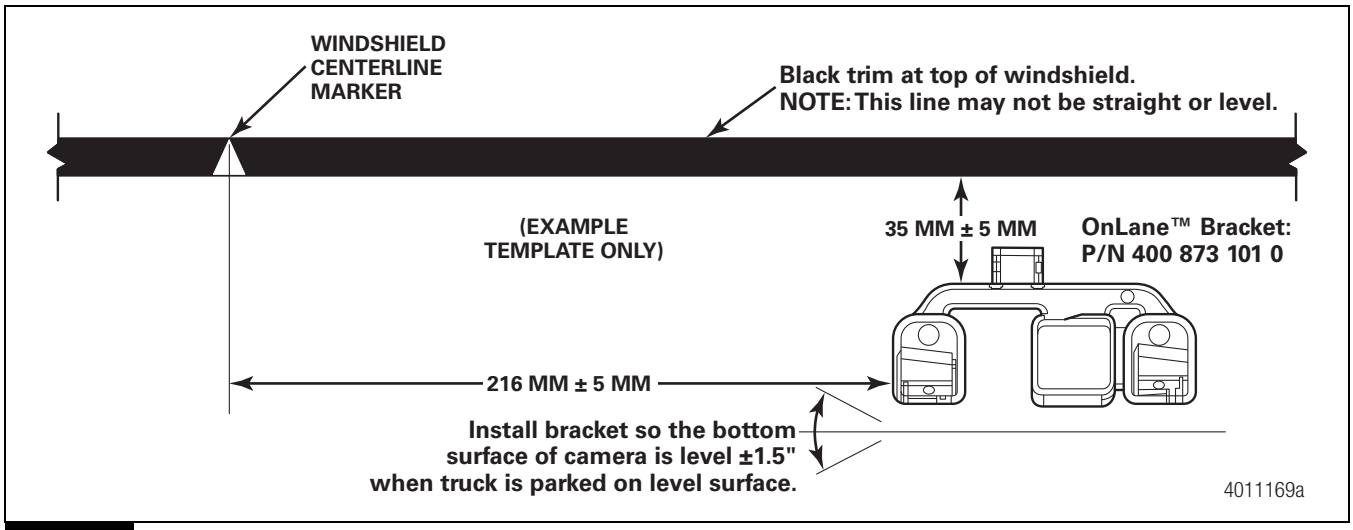
WINDSHIELD CENTERLINE MARKER
Black trim at top of windshield.
NOTE: This line may not be straight or level.
(EXAMPLE TEMPLATE ONLY)
35 MM ± 5 MM
OnLane™ Bracket:
P/N 400 873 101 0
216 MM ± 5 MM
Install bracket so the bottom surface of camera is level ±1.5" when truck is parked on level surface.
4011169a

Figure 3.1

5. Remove the liners from the adhesive pads on the bracket. Figure 3.2.

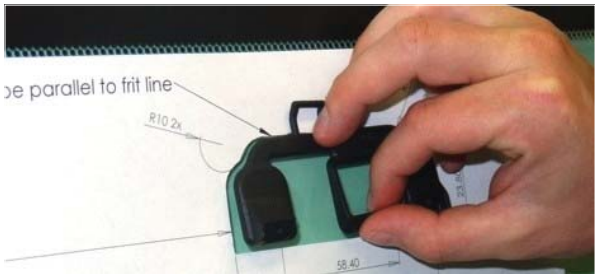

Figure 3.2

6. Hold the bottom of the bracket slightly away from the glass and align the top of the bracket to the top of the template cutout.
7. Bring the bottom of the bracket adhesive pads into contact with the glass and press the bracket firmly against the glass. Maintain a minimum of 45 pounds of force for 30 seconds. Wait 15–30 minutes for the mounting bracket adhesive to set.
8. Remove the yellow lens cap from the new LDW unit and position the LDW unit onto the mounting bracket in a slightly swung up position to align the upper tab. Align the two lower tabs on the LDW unit by rotating the unit downward with the lower tabs on the mounting bracket. Figure 3.3.

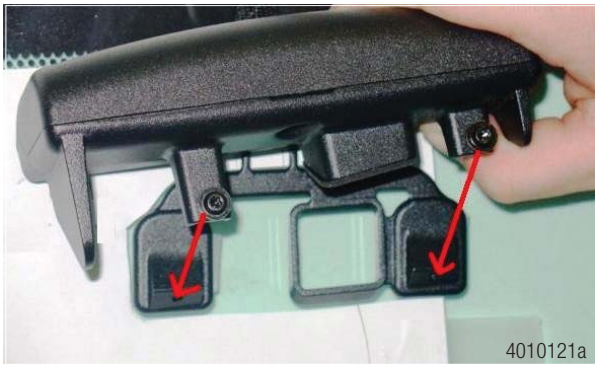

Figure 3.3

9. Install the two T15 torx head screws holding the LDW to the mounting bracket. Tighten the screws to 2.5 +/- 0.4 N•m (22 +/- 3.5 ft-lb). DO NOT OVERTIGHTEN.
10. Connect the LDW connector to the vehicle wiring harness and tuck the connector behind the headliner.
11. Perform the power-on self test and verify that there are no fault codes present in the LDW module.
12. Perform the LDW system test.
13. Install the headliner as described in the vehicle service manual procedures.

Replacing a New LDW Module on an Existing Bracket

You can replace a damaged or faulty LDW unit on the existing bracket provided that the mounting screw holes in the bracket are not damaged or worn.

1. Disconnect the vehicle battery.
2. Loosen the forward portion of the headliner as outlined in the vehicle service manual to gain access to the LDW connector.
3. Disconnect the LDW connector from the vehicle wiring harness.
4. Back out the two T15 torx head screws far enough to disengage the screws from the windshield mounting bracket.
5. Rotate the LDW unit upward and back slightly to disengage from the bracket. Figure 3.4.

Figure 3.4

6. Remove the yellow lens cap from the new LDW unit. Position the new LDW unit onto the mounting bracket in a slightly swung up position to align the upper tab and rotate the unit downward to align the two lower tabs on the LDW unit with the lower tabs on the mounting bracket.

   Follow the instructions on the template. Figure 3.5.

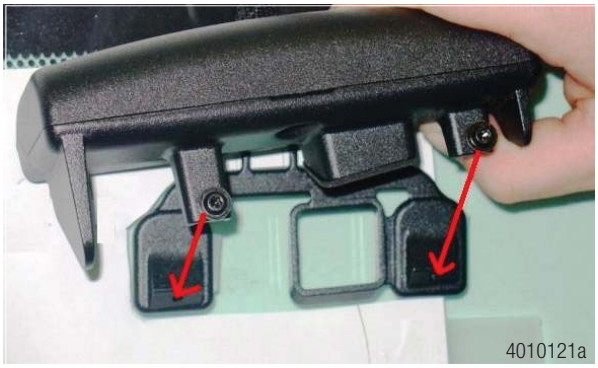

Figure 3.5

7. Install the two T15 torx head screws holding the LDW to the mounting bracket. Tighten the screws to 1.7 +/- 0.2 N•m (13.2 +/- 1.5 ft-lb). Re-installation of the mounting screws into an existing bracket requires less torque than the original installation of the screws. DO NOT OVERTIGHTEN.
8. Connect the LDW connector to the vehicle wiring harness and tuck the connector back into its original position behind the headliner.
9. Perform the power-on self test and verify that there are no fault codes present in the LDW module.
10. Install the headliner per the vehicles service manual procedures.

Replacing a Complete LDW Module and Bracket

Install a new LDW mounting bracket if any of the following conditions occur.

- If a new system is being installed.
- If the windshield has been replaced and the new windshield does not contain a LDW mounting bracket.
- If the mounting bracket has become loose or has fallen off the windshield.
- If the mounting bracket screw holes have become stripped or damaged.
- If the mounting bracket has been removed.

Before securing the bracket to the windshield, note that the locations of the mounting screws on the bracket are not tapped. We recommend that you install the bracket to the LDW module before installing it in the vehicle. Use the self-tapping mounting screws of the LDW module to start the threads for the mounting screws on the bracket. This action will allow for easier installation of the LDW module to the bracket, once the bracket is installed to the windshield.

The LDW system should only be installed on a windshield when the glass temperature is within the recommended range between 70–100°F (21– 37°C). Do not apply the bracket if the windshield temperature is below 60°F (15°C).

1. If necessary, remove the LDW unit from the bracket, back out the two T15 torx head screws far enough to disengage the screws from the windshield mounting bracket.
2. If necessary, rotate the LDW unit upward and back slightly to disengage from the bracket, and secure the unit to the sun visor. Do not let the unit hang by the wiring harness. Figure 3.6.

Figure 3.6

3. If necessary, remove bracket using a putty knife, razor blade or similar tool. Scrape bracket at edges and pry loose. Figure 3.7.

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Figure 3.7

4. If necessary, remove all adhesive and other contaminants from the windshield. Failure to remove all material from glass may result in inadequate adhesion of new bracket. Clean the windshield mounting surface with IPA wipe (50/50 mix of isopropyl alcohol and water) or equivalent cleaner.
5. Allow the mounting surface to dry completely before proceeding to the next step. The windshield surface must be free of all oil, moisture and dirt for correct mounting bracket adhesion.

   NOTE: To download mounting bracket installation templates, visit the OnLane™ literature web page at meritorwabco.com.

6. Align the template so that the markings on the template are square to the centerline markings and the frit/trim line markings at the top of the windshield. Figure 3.8. The template shown is an example only.

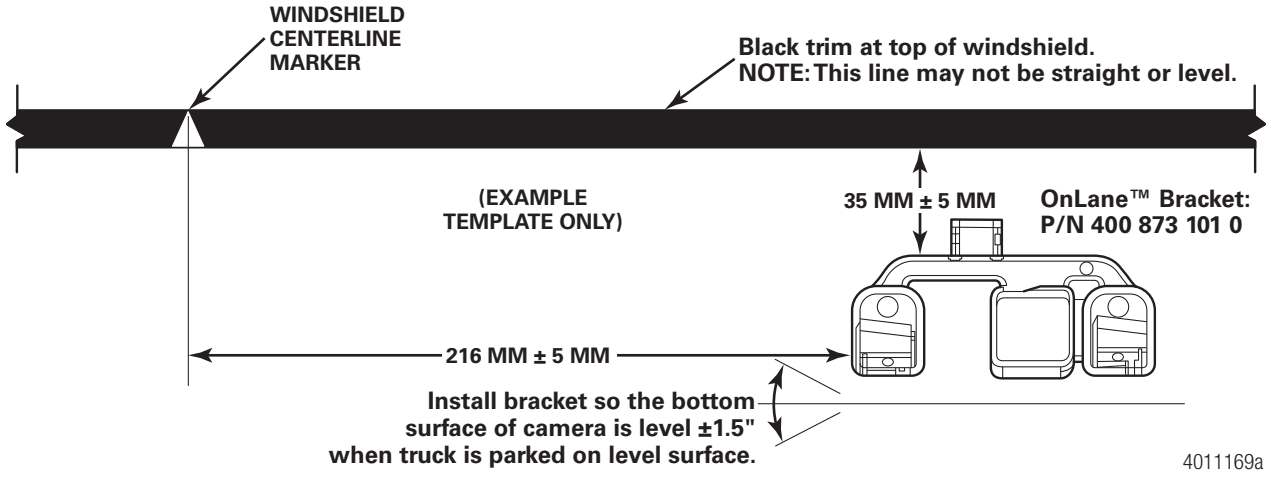

Figure 3.8

7. Remove the liners from the adhesive pads on the bracket. Figure 3.9.

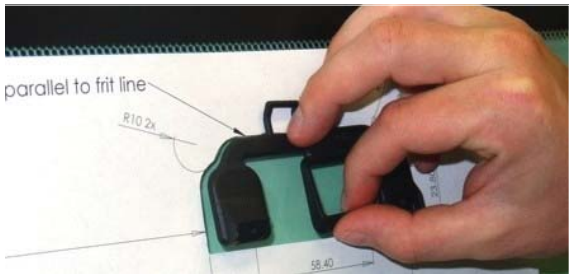

Figure 3.9

8. Hold the bottom of the bracket slightly away from the glass and align the top of the bracket to the top of the template cutout.
9. Bring the bottom of the bracket adhesive pads into contact with the glass and press the bracket firmly against the glass. Maintain a minimum of 45 pounds of force for 30 seconds. Wait 15–30 minutes for the mounting bracket adhesive to set. Figure 3.10.

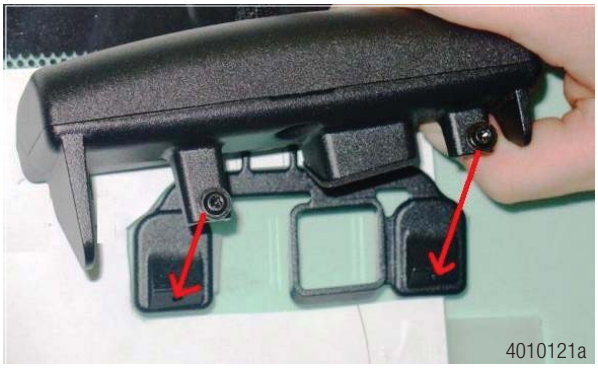

Figure 3.10

10. Remove the yellow lens cap from the new LDW unit and position the LDW unit onto the mounting bracket in a slightly swung up position to align the upper tab. Align the two lower tabs on the LDW unit by rotating the unit downward with the lower tabs on the mounting bracket. Figure 3.10.
11. Install the two T15 torx head screws holding the LDW to the mounting bracket. Tighten the screws to 2.5 +/- 0.4 N•m (22 +/- 3.5 ft-lb). DO NOT OVERTIGHTEN.

Wiring Harness Installation OnLane™

1. Install the system wiring harness as shown. Make sure that you do not pinch or cut the cables or wiring during installation of the harness and trim panel or trim panel attaching screws. Figure 3.11.

   Use zip ties or straps as necessary to secure the harness to prevent movement that may cause vibrations or compromise harness integrity. Be careful to ensure that the wiring harness is clear of all screw locations, including headliner and visor locations. This prevents intrusions that may affect the integrity of the wiring harness.

   Most connections to the vehicle wiring are made on the passenger side of the vehicle, so routing the wiring harness to the passenger side A-pillar is recommended. However, wiring can be routed to either side.

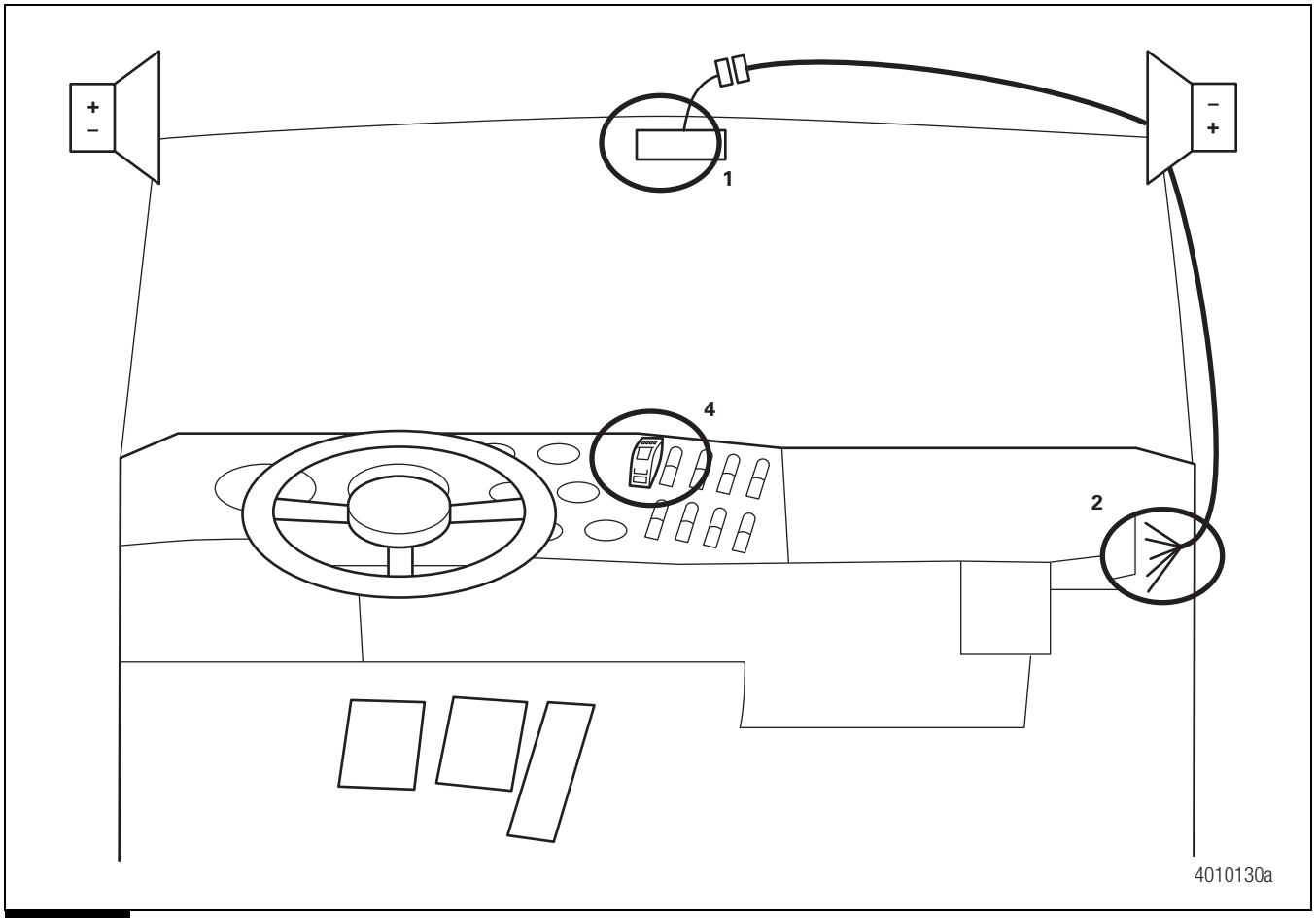

Figure 3.11

2. Route the camera harness up the A-pillar and along the vehicle headliner as shown Figure 3.11. Make sure that enough harness is present to allow connect/disconnect of the camera connector without stressing the harness or the connector.
   - Tuck the camera harness inside the headliner to mate with the wiring harness connector from the A-pillar.
   - Route wires to be connected to the warning speakers to the location where the speakers will be mounted.
   - Route the mute button connector behind the dash to the desired location for the mute button. If there is no opening on the dash panel that can accommodate the mute button, one should be made.
   - The remaining wires can be routed under the instrument panel for connection to the vehicle wiring.

Install the OnLane™ Warning Speakers and Grills

1. Identify the location in the truck where the OnLane™ warning speakers will be mounted. Crimp female slide on terminals to the harness you routed to the speakers mounting location.
   - Green (+) and green/black stripe (-) twisted pair = left speaker.
   - Purple (+) and purple/black stripe (-) twisted pair = right speaker.
2. Use the machine screws, washers and lock nuts supplied with the system to install the speakers and grills. It may be necessary to cut holes into the headliner or trim to accommodate the speakers and grills.

   For ease of installation, be sure to connect the female slide-on terminals to the speakers prior to bolting the speakers and grills in place.

Install Operator Mute Button Rocker Switch

1. Locate a blank opening in the dashboard to accommodate the mute button, which is a rocker switch. If one is not available, make an opening in the dash to accommodate the button.
2. Pull the mute button connector to the back of the opening and connect to the button as shown. Figure 3.12.

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Figure 3.12

Connecting Wiring Harness to Vehicle Wiring

⚠ CAUTION

Disconnect vehicle battery before proceeding.

The installation package includes a wiring harness that must be connected to the vehicle wiring. Brake and turn signal inputs must provide a transition from 0V to +12VDC when the turn signal and brake lights are activated.

1. Assemble the OEM truck wiring diagrams and the OEM truck service/repair manual information necessary to correctly route the wire harness into the headliner and behind the dashboard and to locate and identify all circuits involved.
2. Connect +12VDC to a switched ignition power source that is only powered when vehicle ignition is on to avoid draining the vehicle battery.
3. Securely connect the wire harness connector to the OnLane™ module and mute button. BE CAREFUL NOT TO PINCH OR DAMAGE WIRES DURING ROUTING.
4. Splice the flying leads from the harness to the various circuits of the vehicle harness. Always follow the correct circuit splicing procedures as outlined in the OEM truck service/repair manual.

   The seven flying leads listed below may not all be required. Consult the installation information for your particular vehicle application, or contact Customer Service.

   - Red – 12VDC Ignition power
   - Black – Vehicle ground
   - Gray – Left turn signal
   - Brown – Right turn signal
   - Pink – Brake
   - Green – J1939 CAN low
   - Yellow – J1939 CAN high
5. After wiring is complete, cut and tape off any of the unused flying leads of the OnLane™ wiring harness.

   Replace the headliner and any trim that may have been removed during installation.

Verifying Correct System Operation

Confirm that the OnLane™ System is installed and operating correctly by verifying the following.

- When the vehicle ignition is turned on, the system issues a trial warning tone from each speaker and illuminates the green and yellow lights on the mute button.
- When the vehicle has reached approximately 42 mph (67.6 kph) on a well-marked road, the amber LDW Not Available indicator goes out, indicating the system is tracking and ready to issue warnings.
- The system does not issue warnings when the brakes are applied or either turn signal is activated.
- The operator can silence any alerts for 10 minutes by pressing the operator mute button. Pressing the mute button again should clear the mute mode and allow warning alerts to sound.
- Verify continuity and correct circuit function by performing the Circuit Mode test.

OnLane™ Circuit Mode Test

1. Turn ignition key to power-up cab. During start up, the amber LDW Not Available indicator and green LDW Enabled indicator on the OnLane™ rocker switch are turned on.
2. Wait for the audible start-up tones to complete. If the indicators do not light or there are no start-up tones, check the OnLane™ power and ground connections, the switch connections and the speaker connections.
3. Enter test mode by depressing the OnLane™ rocker switch at least seven times within ten seconds after the audible start-up tones are complete. The system indicates that it is in test mode by giving a short tone through the left speaker followed by one through the right speaker. In a single speaker system, both tones come through that speaker. While in test mode, the green LDW Enabled indicator is turned off and the amber LDW Not Available indicator flashes.

   This test mode times out in 10 minutes. Turning off the vehicle also causes the test mode to close.

   If the amber LDW Not Available indicator is ON and green LDW Enabled indicator is OFF, this indicates that a system fault is present. The system identifies the fault by flashing the green LDW Enabled indicator.

   If the green LDW Enabled indicator flashes, the system is either running one of the tests described below or identifying a fault.
4. Briefly activate the left turn signal and verify that a tone is heard through the left speaker and the green LDW Enabled indicator flashes. If a warning tone is not heard, check the left turn signal connection.
5. Briefly activate the right turn signal and verify that a tone is heard through the right speaker and the green LDW Enabled indicator flashes. If a warning tone is not heard, check the right turn signal connection.
6. Activate the brake and verify that the green LDW Enabled indicator is turned on. If it is not turned on, check the brake connection.
7. Turn the ignition key off to power down and exit the test mode.

   If the self tests have not completed successfully, the vehicle's green indicator begins to flash to identify the fault.

OnLane™ Test Mode Faults

Read the fault code by counting the series of green LDW Enabled indicator flashes. For example, if the fault code is 2, 3, the system will flash ON two times for the first digit 2, pause for 3 seconds and then flash ON 3 more times for the second digit 3, to indicate a 2, 3 fault code. Figure 3.13.

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Figure 3.13

When the code display is complete, the green LDW Enabled indicator switches OFF.

Redisplay the fault code by pressing and releasing the OnLane™ switch one time or connecting with TOOLBOX™ 11.1 Software. Refer to the fault codes on page 5.

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